

CALIBRATION STANDARD REQUIREMENT
FOR A
PORTABLE TORQUE WRENCH CALIBRATOR

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PROCUREMENT PACKAGE

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CALIBRATION STANDARD REQUIREMENT FOR A
PORTABLE TORQUE WRENCH CALIBRATOR

1. SCOPE

1.1 Scope. This requirement defines the mechanical, electrical, and electronic characteristics for a Portable Torque Wrench Calibrator. This equipment is intended to be used by Navy personnel in shipboard and shorebased laboratories to calibrate various torque wrenches, torque screwdrivers, and torque multipliers. For the purposes of this requirement, the Portable Torque Wrench Calibrator shall be referred to as the PTWC.

1.2 PTWC System. The PTWC system shall consist of the torque loader, torque transducer(s), digital torque indicator, reaction posts and fixtures, square adapters, and torque extension arm all contained in the torque loader case.

2. APPLICABLE DOCUMENTS

2.1 Controlling Specifications. MIL-T-28800, "Military Specification, Test Equipment for use with Electrical and Electronic Equipment General specification for," and all documents referenced therein of the issues in effect on the date of this solicitation shall form a part of this requirement.

3. REQUIREMENTS

3.1 General. The PTWC shall conform to the Type II, Class 5, Style E requirements as specified in MIL-T-28800 for Navy shipboard and shorebased use as modified below. The use of material restricted for Navy use shall be governed by MIL-T-28800.

3.1.1 Design and Construction. The PTWC design and construction shall meet the requirements of MIL-T-28800 for Type II equipment.

3.1.2 Power Requirements. The PTWC shall operate from a source of 103.5V to 126.5V at 50 Hz and 60 Hz (5% single-phase input power as specified in MIL-T-28800.

3.1.2.1 Battery Power. The PTWC shall have a sealed battery that will provide power for operation for at least 8 hours. The unit shall have a charger that charges the battery while the unit is connected to line power. The battery shall not be damaged when the unit is idle or operating under line power for at least 72 hours.

3.1.2.2 Fuses or Circuit Breakers. Fuses or circuit breakers shall be provided. If circuit breakers are used, both sides of the power source shall be automatically disconnected from the equipment in the event of excessive current. If fuses are used, only the line side of the input power line, as defined by MIL-C-

28777, shall be fused. Fuses or circuit breakers shall be readily accessible.

3.1.2.3 Power Connection. The requirements for power source connections shall be in accordance with MIL-T-28800 with a 6-foot (1.8 meter) minimum length cord.

3.1.3 Dimensions and Weight. Maximum dimensions shall not exceed 30 inches (76.2 cm) in width, 9 inches (22.9 cm) in height, and 15 inches (38.1 cm) in depth. The weight shall not exceed 70 pounds (31.8 kg).

3.1.4 Lithium Batteries. Per MIL-T- 28800, lithium batteries are prohibited without prior authorization. A request for approval for the use of lithium batteries, including those encapsulated in integrated circuits, shall be submitted to the procuring activity at the time of submission of proposals. Approval shall apply only to the specific model proposed.

3.2 Environmental Requirements. The PTWC shall meet the environmental requirements for a Type II, Class 5, Style E equipment with the deviations specified below.

3.2.1 Temperature and Humidity. The PTWC shall meet the conditions below:

	<u>Temperature ($^{\circ}$C)</u>	<u>Relative Humidity (%)</u>
Operating	10 to 30	95
	30 to 40	75
Non-operating	-40 to 70	Not Controlled

3.2.2 Electromagnetic Compatibility. The electromagnetic compatibility requirements of MIL-T-28800 are limited to the following areas: CE01, CE03, CS01, CS02, CS06, RE01, RE02, (14 KHz to 1 GHz), and RS03.

3.3 Reliability. Type II reliability requirements are as specified in MIL-T-28800.

3.3.1 Calibration Interval. The PTWC shall have an 85% or greater probability of remaining within tolerances of all requirements at the end of a 12 month period.

3.4 Maintainability. The PTWC shall meet the Type II maintainability requirements as specified in MIL-T-28800 except the lowest discrete component shall be defined as a replaceable assembly. Certification time shall not exceed 60 minutes.

3.5 Performance Requirements. The PTWC shall provide the following capability as specified below. Unless otherwise indicated, all requirements shall be met following a 30-minute warm-up time.

3.5.1 System Requirements. All the paragraphs of this PTWC specification shall apply to torque in the clockwise and counterclockwise direction during torque generation, measurement and control.

3.5.1.1 Torque Range. The PTWC shall measure and display static bi-directional torque throughout the range of 0 to 800 Lb-ft.

3.5.1.2 Operator Interface. The PTWC's configuration shall allow a single operator to generate and control the torque with one hand using a maximum of 10 lb force applied to the input hand wheel control.

3.5.1.3 Stability. The PTWC shall hold the applied load stable within 10 counts for a minimum of 5 minutes.

3.5.1.4 Generation. The PTWC shall generate and control torque throughout the range of 0 to 800 Lb-ft (bi-directional). The system used to generate and/or control torque shall not use weights. The PTWC shall be able to generate 800 Lb-ft torque from an unloaded mode in a maximum of 3 minutes.

3.5.1.5 Setability. The PTWC shall have the ability to set the output torque (bi-directional) to an exact cardinal test point value in the range of 0 to 800 lb-ft with a tolerance of (0.005 lb-ft).

3.5.2 Torque Loader Requirements. The PTWC shall have a torque loader that meets the following requirements.

3.5.2.1 Manual Torque Generation. Torque shall be manually generated by the operator within the requirements of paragraph 3.5.1.1 through 3.5.1.2.

3.5.2.2 Torque Tool Capability. The PTWC shall have a mechanism to vary the distance from the torque transducer to the reaction post over the range of 7 to 19 inches (17.8 to 48.3 cm), as a minimum.

3.5.2.2.1 Wrench Extension Fixture. The PTWC shall have a wrench extension fixture that mounts on the torque loader which extends the working length to the reaction post at least an additional 17 inches (43.2 cm) over the nominal torque loader range specified in paragraph 3.5.2.2 for the calibration of long handled torque wrenches. The PTWC shall have a total range when the wrench extension fixture is mounted of at least 36 inches (91.4 cm).

3.5.2.3 Reaction Post. The PTWC shall have a reaction post. The reaction post shall be easily removable. The reaction post shall also mount into the wrench extension fixture.

3.5.3 Torque Indicator. The PTWC shall include a two-channel torque indicator.

3.5.3.1 Indicator Accuracy. The indicator shall have an accuracy of (0.01% FS or better).

3.5.3.2 Torque Resolution. The indicator shall have a resolution of (10,000 counts or better).

3.5.3.3 Torque Peak Hold. The PTWC shall be capable of holding and indicating the maximum torque applied during a torque measurement cycle. The peak hold shall have automatic and manual reset.

3.5.3.4 Zero Set. The PTWC indicator shall have a push button to zero the display when the load is removed.

3.5.3.5 Torque Display. The PTWC shall have a display that is easily operated from the front panel. The PTWC shall display the following torque units: lb-ft, lb-in, N-m, m-Kg.

3.5.6 Torque Transducers. The PTWC shall have a set of at least two torque transducers that can transduce torque to the following tolerances or better:

Cell Range	Cell Accuracy
0-50 Lb-ft (0-68 N-m)	(0.2 %IV
0-800 Lb-ft (0-1085 N-m)	(0.2 %IV

3.5.6.1 Transducer Overload. The torque transducers shall be able to withstand an overload condition of at least 150% of the individual transducer's range.

3.5.6.2 Transducer Cables. All cabling shall be included to connect the transducers to the PTWC and/or indicator.

3.5.6.3 Torque Transducer Compatibility. The torque transducers shall be fully compatible with the torque loader and the torque indicators. The adapters designated in section 3.7 can be utilized to achieve the compatibility requirements.

3.5.7 Safety. Design of the PTWC shall be inherently safe. Any reaction posts or similar structures attached to the frame shall be designed to a safety factor of 5 or better on ultimate material strength. Failure modes of external members shall not entail fracturing of pins or stripping of threads, or similar failures resulting from elongation of holes, or bending of pins.

3.6 Operating Requirements. The PTWC shall provide the following operating capabilities.

3.6.1 Front Panel Control Requirements. All modes and functions shall be operable using front panel controls. The locations and labeling of indicators, controls, and switches shall provide for maximum clarity and easily understood operation without reference to tables, charts, or flow diagrams.

3.6.2 Error Correction. During calibration, the PTWC shall provide the capability to accept and store corrections for all measurement deviations from nominal conditions. This correction capability shall be operational from the front panel control. The PTWC shall be capable of changing any calibration factor or other correction data stored in memory of the PTWC without removal of any memory circuits or devices. The calibration constants may be changed only if the switch (not a key switch) on the rear panel is enabled.

3.6.3 Self-Test. The self-test shall comprise two selectable levels, an operational test to determine if the instrument is operationally ready, and a second level diagnostic test to diagnose and isolate faulty field replaceable modules. When the self-test function is initiated, an auto-sequenced internal operation test shall be performed. The diagnostic test shall be selectable only by deliberate operator command.

3.7 Accessories.

3.7.1 Adapters. The PTWC shall include the following adapters to allow the proper interface with common torque tools or transducers and the torque loader.

3.7.1.1 Square Drive Adapter plates. The PTWC shall have a set of adapter plates to connect square drive torque tools to the torque transducer(s) that consist of the 1/4 inch; 3/8 inch; 1/2 inch; 3/4 inch sizes.

3.7.2 Case. The PTWC shall be contained in a rugged case. All adapters, cords, and accessories shall be stored in the case and mounted to prevent movement during transportation. The input drive hand wheel may be mounted external to the case. The case shall have handles located in such a way to allow either one or two people to carry the PTWC.

3.8 Manual. At least two copies of an operation and maintenance manual shall be provided. The manual shall meet the requirements of MIL-M-7298.

3.8.1 Calibration Procedure. The manual shall provide a calibration procedure for the PTWC in accordance with MIL-M-38793.

